

# UM1486 User manual

iNEMOENgine\_PW8 software package

### Introduction

This document describes the features of the iNEMOENgine\_PW8 software package and the device firmware upgrade (DFU) procedure to upload it to the microcontroller of the STEVAL-MKI119V1 MEMS sensor demonstration kit.

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## 1 Software package description

The iNEMOENgine\_PW8 software package includes the following directory structure:

- Doc: contains the license agreement for the software, the release notes and this
  document
- DFU: contains the installation package for the software needed to upgrade the firmware of the STEVAL-MKI119V1 demonstration kit
- Firmware: contains the binary file that can be flashed to the microcontroller of the STEVAL-MKI119V1 using the DFU software

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## 2 iNEMOENgine

The iNEMOENgine\_PW8 software package includes the iNEMOENgine library.

The iNEMOENgine is a new, advanced software engine that fuses accelerometer, gyroscope and magnetometer data to deliver accurate and reliable motion-sensing information that is easy to integrate into smart consumer devices.

The iNEMOENgine fuses data from the integrated 9-axis sensor suite with advanced algorithms that use true high-number-of-states adaptive Kalman filtering.

The iNEMOENgine's adaptive filters converge so that correct heading data overrides magnetic distortions and anomalies, resulting in more accurate and reliable data.

iNEMO allows the correction of:

- magnetic distortions registered on the magnetometers
- dynamic distortion measured by the accelerometers
- inherent drift of the gyroscope over time

The iNEMO engine integrates all 9 inertial axes plus compass with complex fusion algorithms, so the output of the sensor cluster is optimized.

This allows for faster, easier integration into smart consumer devices and higher performance of the solution as a whole.

Library output:

- Quaternions four number hpr system
- Rotation: heading, pitch, and roll
- Linear acceleration: device frame linear accelerations
- Gravity: device frame gravity acceleration

#### **Device upgrade procedure (DFU)** 3

#### **DFU** software installation 3.1

Run the DfuSe\_Demo\_V3.0\_Setup.exe file located in the DFU directory of the software package. The InstallShield Wizard will guide you to install the DfuSe applications and source code on your computer. When the software is successfully installed, click the "Finish" button. You can then explore the driver directory.

The driver files are located in the "Driver" directory in the install path (C:\Program files\STMicroelectronics\DfuSe).

The documentation is located in the

"C:\Program Files\STMicroelectronics\DfuSe\Sources\Doc" folder.

Figure 1. DfuSe user interface DfuSe Demo (v3.0.0) DFU Mode Vendor ID: 0483 Vendor ID: Supports Download Accelerated pload (ST) Procuct ID: DF11 Can Detach Leave DFU mode Actions Select Target(s): Target Id Name Available Sectors (Double Click for more) 00 01 Internal Flash 128 sectors. 128 sectors. SPI Flash : M25P64 Upload Action Upgrade or Verify Action File: Targets in file Vendor ID: Choose... Procuet ID: 0 KB(0 Bytes) of 0 KB(0 Bytes) Verify after download Optimize Upgrade duration (Remo 00:00:00 Choose Quit AM10758v1

## 3.2 Firmware upgrade

- 1. While keeping button 1 on the board (*Figure 2*, item 1) pressed, connect the device to a spare USB port on your PC. LED 1, 2 and 3 (*Figure 2*, item 2) will switch ON to signal that the microcontroller has entered DFU mode.
- 2. Open the Device Manager, and go to "Other devices". Right click on the "STM32 DFU" item (*Figure 3*) and select "Update Driver...". Use the drivers located in the "C:\Program Files\STMicroelectronics\Software\DfuSe\Driver" folder.
- 3. The driver is now correctly installed (Figure 4).
- 4. Run the "DfuSe demonstration" application (Start -> All Programs -> STMicroelectronics -> DfuSe -> DfuSe Demonstration or C:\Program Files\STMicroelectronics\Software\DfuSe\BIN\DfuSeDemo.exe). The STEVAL-MKI119V1 is recognized in DFU mode (Figure 1, item 4).
- 5. Click the "Choose" button (*Figure 1*, item 1) to select the DFU file provided with the package in the Firmware directory. The displayed information, such as VID, PID, Version and target number is read from the DFU file.
- 6. Click the "Upgrade" button (*Figure 1*, item 2) to start upgrading file content to the memory.
- 7. Click the "Verify" button (*Figure 1*, item 3) to verify that the data was successfully downloaded.
- 8. Click the "Leave DFU mode" button (*Figure 1*, item 5) or disconnect the board.

The firmware is now updated and the board ready to be used.

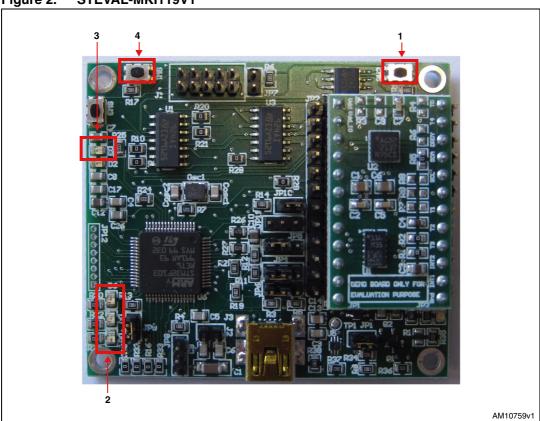


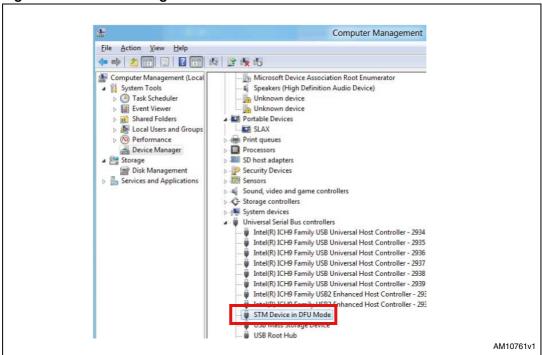
Figure 2. STEVAL-MKI119V1

AM10760v1

Computer Manage File Action View Help Computer Management (Local MEM\_PC\_HP ■ System Tools Batteries ( Task Scheduler Bluetooth D- Computer ▶ Event Viewer ▶ Shared Folders Disk drives De Local Users and Groups Display adapters Derformance DVD/CD-ROM drives Device Manager ■ IDE ATA/ATAPI controllers ▲ 📇 Storage ▶ - ₩ IEEE 1394 Bus host controllers Disk Management Keyboards Mice and other pointing devices Services and Applications Modems Monitors Monitors Network adapters ▲ - (2) Other devices Base System Device Fingerprint Sensor Lightweight Sensors Root Enumerator Line In (High Definition Audio Device) Microphone (High Definition Audio Device) Microsoft Device Association Root Enumerator ion Audio Device) STM32 DFU

Figure 3. Device manager - no DFU driver installed

Figure 4. Device manager - DFU driver installed



UM1486 Using the board

## 4 Using the board

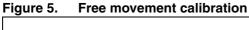
Once the STEVAL-MKI119V1 has been upgraded with the iNEMOENgine\_PW8 software package, it allows connection through the USB interface to any PC running the Windows 8 operating system. After the kit is connected, it is recognized as an HID sensor cluster and accesses gyroscope, accelerometer, heading, inclinometer and quaternions data to be employed for user applications.

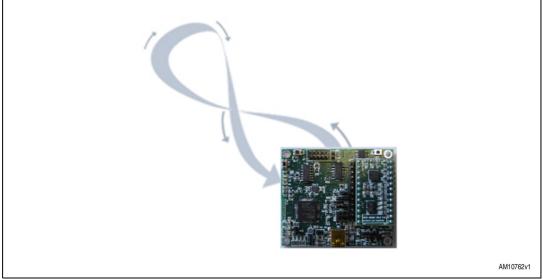
### 4.1 Board calibration

Before using the board for the first time, calibration is required. To enable the calibration routine, press button 3 (*Figure 2*, item 4). LED D6 of the board (*Figure 2*, item 2) will remain ON until the calibration routine is completed.

Two movements may be executed to calibrate the board:

1. Move the board in the space as shown in Figure 5





2. Move the board in the space as described in Figure 6

Using the board UM1486

Side view

Front view

Side view

Side view

Side view

AM10765v1

Figure 6. Fixed movement calibration

UM1486 Revision history

# 5 Revision history

Table 1. Document revision history

| Date        | Revision | Changes          |
|-------------|----------|------------------|
| 02-Nov-2011 | 1        | Initial release. |

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